

are mutually convertible, for the appearance of electricity represents a corresponding disappearance of matter. The theories of the indestructibility of matter and energy are overthrown. All matter and energy are disappearing from the universe to be ultimately converted into æther.

The second half of the book contains an account of experiments, with numerous illustrations by the author in support of his views. Some simple electrostatic experiments are described from which he draws truly astonishing conclusions. The latter part of the book is devoted to a description of his experiments on phosphorescence and "black light." This portion of the book will be found very instructive to those who are interested in the little-known subject of phosphorescence. A number of striking experiments are described, and the author has obviously taken great trouble to make the results as conclusive as possible. The general idea is that phosphorescence is a result of the transformation of atoms of matter. There still remains much to be done in this field of inquiry, but it has not yet been proved that the molecular combinations and dissociations under the influence of light are not sufficient explanation without having recourse to the transformation of atoms.

The book is full of trenchant criticisms, and neither principles nor theories are spared which do not fall in with the author's views. We gather, whether rightly or wrongly, that the author has little respect for the orthodox man of science, whom, apparently, he considers is steeped in formulæ and filled with conservatism, but yet not so conservative that he is not capable of taking the excellent views of Le Bon without giving credit for them. We are familiar with examples of our non-mathematical scientific brethren who abhor the sight of a simple equation. M. Le Bon is evidently of their opinion, as may be seen from the following quotation, which also serves as an example of his vigorous style:—

"What has finally given very great force to certain principles of physics and mechanics has been the very complicated mathematical apparatus in which they have been wrapped. Everything presented in an algebraical form at once acquires for certain minds the character of indisputable truth. The most perfect sceptic willingly attributes a mysterious virtue to equations and bows to their supposed power. They tend more and more to replace, in teaching, reason and experience. These delusive veils which now surround the most simple principles only too often serve to mark uncertainties. It is by lifting them that I have succeeded more than once in showing the frailty of scientific beliefs which for many scholars possess the authority of revealed dogmas."

Assuming the correctness of the hypotheses and statements of the author, the book forms interesting reading, and is full of original ideas. It is a different matter when one proceeds to examine the evidence in favour of his theory. Men of science are very chary, and rightly so, of hypotheses reared on a very slender foundation of fact which endeavour to account for the universe and all that it contains. Some experimental proof is required before such hypotheses are seriously entertained. It is true that the study of the radio-active bodies has led to the belief that the

atoms of active matter undergo spontaneous transformation and are the seat of a large store of energy. Many are prepared to believe that the same is true of the atoms of ordinary matter. Experiment seemed at first to indicate that all matter was radio-active, and was in a state of slow transformation. Recent work, however, has cast grave doubt on this conclusion, for it is fairly certain that the greater part of the apparent activity of ordinary matter, with the exception, possibly, of potassium and its salts, can be explained without the necessity of assuming that the atoms of ordinary matter are disintegrating. The study of the internal heat of the earth shows that if ordinary matter is evolving energy due to atomic transformation, it must do so at a rate very small compared with even a weakly radio-active substance like uranium. As Strutt has pointed out, the internal heat of the earth would be much greater than it is if ordinary matter disintegrated at even one-thousandth the rate of uranium. It is probable that the transformation of the atoms of matter may be much accelerated under the influence of exceedingly high temperature and its accompanying manifestations. It seems to have been overlooked that Sir Norman Lockyer long ago advanced this idea from a study of the constitution of the stars. The astronomical evidence in support of the view that the atoms of matter undergo transformation is collected in his interesting book, "Inorganic Evolution."

One of the main hypotheses of Le Bon is that electricity is derived from the decomposition of atoms of matter. On this view, the electricity which passes through a copper wire is derived at the expense of the copper, and ultimately the latter will vanish into a quantity of intangible æther. On account of the great store of electricity in an atom of matter, this disappearance will take place very slowly. It is now generally believed that the passage of electricity through a conductor is due to the transference of charged carriers, but it is exceedingly doubtful whether there is any loss of matter in the process. There is so far not the slightest experimental evidence in favour of the assumption.

The book is clearly written, and the interest is maintained throughout. We can recommend it to readers who are interested in revolutionary ideas of physics and in the spectacle of the *débâcle* (according to Le Bon) of a large amount of scientific doctrine. We would suggest, however, that the reader need be under no obligation to consider the statements contained in it as the latest accepted scientific gospel.

#### BIOGRAPHY OF SPENCER.

*The Life and Letters of Herbert Spencer.* By Dr. David Duncan. Pp. xi+621; with seventeen illustrations. (Lóndon: Methuen and Co., n.d.) Price 15s.

IT is not long since we had Mr. Herbert Spencer's voluminous "Autobiography," and now we have his "Life and Letters"—a labour of love executed with marked success by Dr. David Duncan, who was for a time the philosopher's secretary and collabo-

rateur. With his characteristic deliberateness, Mr. Spencer arranged for this "Life" some twenty-eight years ago, and he confirmed the arrangement in his will. He felt that an autobiography is from the nature of the case likely to give a partial picture of the man, and this is borne out by reading the "Life." Although Herbert Spencer was unusually gifted with the power of regarding himself almost impersonally as a phenomenon, the result of the "Autobiography" was to leave some false impressions, as, for instance, that he was "all brains and no heart." Besides correcting the partiality of Spencer's self-portraiture, the "Life" contains many letters of historical interest, an important document entitled "The Filiation of Ideas" (1898-9), and valuable summings up, such as the chapter on Spencer's views on inorganic evolution. Moreover, it is the only authoritative record of the twenty-one years that elapsed after the completion of the "Autobiography."

The biographer has done his work with great skill, welding his material into a continuous narrative, and preserving throughout a keen sense of perspective. One wishes that he had not hidden himself quite so much, for he had unusual opportunities of knowing Spencer; but perhaps his very objective mode of treatment is the higher art, and in any case it is peculiarly congruent with the subject.

The fine chapters at the end of the biography which deal with "Characteristics and Personal Reminiscences" and with "Spencer's Place in the History of Thought" are less objective than the rest of the book, and will be read with great interest.

Much of the "Life" necessarily covers somewhat familiar ground, and confirms impressions which the "Autobiography" gives. Again we see how the inherited strain of nonconformity and independence expressed itself consistently throughout Spencer's life in things great and small. In 1842 a friend called him "radical all over," and it was a descendant of the man who could not lift his hat without violating his principles, that would not go to Lady Derby's "At Home," either with a levee dress or without one, to have the honour of meeting His Majesty the Emperor of Russia, and who omitted the Duke of Argyll's name from a reference in one of his pamphlets lest some people should regard him as a snob. But it was the same irreconcilable dissenter who let hardly a year pass without acting as champion of some unpopular cause, who was, where principle was involved, absolutely reckless of popularity, who did not know what it was to fear the face of man.

Again, as in the "Autobiography," the reader is surprised, sometimes even startled, by some of Spencer's judgments, both as to the work of others and his own. "I have lately been reading," he writes in 1843, "Pope's 'Homer.' . . . To my taste there is but little real poetry in it . . ." In 1852 he writes, "Though a Scotchman (and I have no partiality for the race) I am strongly inclined to rank Alexander Smith as the greatest poet since Shakespeare." We cannot but like the philosopher better when we find him telling his father, concerning the "Psychology," "My private opinion is that it

will ultimately stand beside Newton's 'Principia,' " and then writing twelve days afterwards that it will be as well not to mention this opinion lest it may be thought "a piece of vanity." Perhaps there was in this some expression of the sense of humour which was so well concealed by the author of the "Synthetic Philosophy" that some who had opportunities of knowing him well have doubted whether it was not vestigial.

The "Life" tells us of much kindness on Spencer's part that the "Autobiography" could not, of course, mention, and the whole impression left is that of a much more human character. In referring to the idea that Spencer was all intellect and no feeling, Dr. Duncan points out that the letters to his parents furnish sufficient disproof.

"Rare indeed are the instances in which father and son have laid bare their minds so freely to one another. Rarer still are the instances in which father and son have for over thirty years carried on their correspondence on such a high level of thought and sentiment."

Of Spencer's capacity for strong friendship, the "Life" affords abundant illustration. In speaking of their old-standing friendship, Huxley wrote:—"It has been the greatest pleasure to me to see the world in general gradually turning to the opinion of you which is twenty years old in my mind"; and again:—"How odd it is to look back through the vista of years! . . . Considering what wilful tykes we both are (you particularly), I think it is a great credit to both of us that we are firmer friends now than we were then." "Wilful tykes" indeed, for this intimate friendship of nearly forty years' standing was almost wrecked by a hot controversy in 1889. This was a grief to both the veteran combatants, who, happily, were great enough, after some years, to shake hands and be friends again.

We hear not a little in the letters about the way in which readers in general and critics in particular "persisted in some absurd misapprehension or other," but we have not found any suggestion on Spencer's part that he might himself be in any way responsible for the misunderstandings which he aroused.

The "Life" does not weaken our impression of Spencer's almost morbid sensitiveness in regard to priority. Now it is some lecture, and again some text-book, that is at fault; at one time it is Henry Drummond, and at another time Charles Darwin, who uses, without sufficient acknowledgment (it is alleged), some conclusion that Spencer had arrived at. He was vexed that so many writers supposed that mental evolution was Darwin's hypothesis.

"As no one says a word in rectification, and as Darwin himself has not indicated the fact that the 'Principles of Psychology' was published five years before the 'Origin of Species,' I am obliged to gently indicate this myself."

In this connection the appendix containing Spencer's account of the filiation of his ideas is interesting, as is also the note in 1860 to the effect that the programme of the "System of Philosophy"

in its finished form was drawn up before he read the "Origin of Species."

It was doubtless Spencer's keen sense of accuracy and justice rather than any feeling of personal rights that made him so sensitive about priority, and it was perhaps his jealousy for the honour of science that led him to behave in a somewhat strange way concerning his election as a foreign correspondent of the Reale Accademia dei Lincei. It should be remembered, too, that while Spencer was unwilling that anyone should use his ideas without acknowledgment, he was even more troubled by the suggestion that he ever did anything of this sort himself. To be accused of cribbing from Comte was a serious charge, though absurd on the face of it; but it seems strange that he should have found it "very annoying" to be accused of stealing the idea of "the gospel of relaxation"—and the phrase as well—from an American writer. This was in allusion to his well-known thesis that "Life is not for learning, nor is life for working; but learning and working are for life"—"a strange maxim this," as the biographer well remarks, "to come from one who scorned delights and lived laborious days in order to complete a task he had deliberately imposed upon himself."

In curious inconsistency with Spencer's sensitiveness over questions of priority was his very small appetite—sometimes amounting to total abstinence—as regards the works of previous evolutionists, and in this connection the "Life" has some additional information that is instructive. Spencer went in for "little reading and much thinking, and thinking about facts learned at first hand."

"All along," he said, "I have looked at things through my own eyes and not through the eyes of others. I believe that it is in some measure because I have gone direct to Nature, and have escaped the warping influences of traditional beliefs, that I have reached the views I have reached."

As one would expect, the "Life" informs us that many of the things said about Spencer were untrue. He once said that he could fill a small volume with absurd stories about himself, and the trouble was that his high standard of accuracy led him to take them somewhat too seriously. Instead of recognising that it is one of the penalties of greatness to become a centre of myths, or contenting himself with docketing the canards as evidences of "the extreme untrustworthiness of human testimony," he was sometimes annoyed by them, and spent time in correcting them—for instance, in the case of the quite innocent statement which appeared in the *Aberdeen Free Press* that Spencer had once written articles on sociology for the *Birmingham Pilot*. As he lived a very quiet life, certainly not one that furnished picturesque copy, there was scope for inventiveness, and thus absurd paragraphs appeared to the effect that Spencer always wore white gaiters, invariably carried a bulky umbrella, lived chiefly on bread and coffee, and changed his occupation every ten minutes. Perhaps the only matter for real regret was that the inventiveness was of so low an order.

The biographer is nothing if not loyal to Spencer;

he is inclined to rebut what seems to us just criticism. We cannot always agree, and we may give one example. At the close of his account of the Weismann controversy—the issue of which is so momentous in relation to Spencer's ætiology—Dr. Duncan says that it is not for a layman to express an opinion on a question that divides biologists into distinct schools. He goes on, as one usually does after this sort of bow, to express very decided opinions.

"Bearing in mind how frequently the charge of a *priori* reasoning has been brought against Spencer, one cannot help remarking on the hypothetical nature of Prof. Weismann's premises and the *a priori* character of his arguments. The demands he makes on one's credulity are, to say the least, not less numerous or less astounding than those made by the opposite school. Prof. Marcus Hartog's description of Prof. Weismann's work on Amphimixis, may be applied to the theory as a whole. It is 'a magnified castle built by the *a priori* method on a foundation of "facts" carefully selected, and for the most part ill known, misinterpreted, or incomplete.'"

This opinion seems to us erroneous and misleading. One may compare Weismann's theory of determinants with Spencer's theory of physiological units; both are imaginative constructions, and unverifiable in any direct way. Experts have to choose the one that seems the simpler, the more consistent with known facts, and the more useful in interpretation, or to refuse them both in favour of a third. But the real issue was not in regard to a subtlety of this sort; it was in great part a question of fact—is there evidence warranting a belief in the transmissibility of somatic modifications?—and as one result of the controversy no evolutionist can any longer make the Lamarckian assumption without some energetic attempt at justification.

Much of the truth which Spencer expounded has now passed into the framework of the scientific universe of discourse; part, perhaps, has still to be incorporated; and not a little, bound up with "use-inheritance," will probably have to be rejected altogether. But, in addition to the reverence and gratitude with which we regard Spencer as thinker and teacher, there must rise in the minds of all who read this "Life" a desire to join with the author in paying homage once more to "the high and indomitable purpose that sustained Spencer throughout these years, enabling him, in face of difficulties that seemed almost insurmountable, ever to keep sight of the goal."

"Take him for all in all," the biographer says, "he was intellectually one of the grandest and morally one of the noblest men that have ever lived. His life was devoted to a single purpose—the establishing of truth and righteousness as he understood them."

Finally, we would say that we have, on reading the "Life," a refreshment of admiration for one who, while he was an intellectual Alpine climber, and accustomed to altitudes where many find it difficult to breathe, yet was a citizen of the world who took much thought for the people. "Ein Kerl der speculirt" was how Huxley, quoting from "Faust,"



described him to Tyndall, but, as Mr. Courtney said in his impressive farewell address, "it must never be forgotten that his one overmastering and dominant purpose was practical, social, human." The cold agnostic, all intellect and no heart, often felt himself called upon "to suspend his work in order to try to convert Christians to Christianity," as Dr. Duncan well puts it. As old age crept on apace, and he was writing his last book, it was anxiety for the welfare of his country that alone disturbed his serenity as he pondered over "ultimate questions," and wondered "Shall I ever again be awakened at dawn by the song of the thrush?"

#### OCULAR PATHOLOGY.

*The Pathology of the Eye.* By J. Herbert Parsons. 4 vols. Vol. i., pp. xiii+388; vol. ii., pp. viii+389-770; vol. iii., pp. x+771-1128; vol. iv., pp. ix+1129-1427. (London: H. Frowde and Hodder and Stoughton, 1908.)

THE recent completion of this work, of which the first volume was published in 1904, marks an epoch in the literature of the pathology of the eye. In his preface the author states that "the object of this treatise is to give as complete an account of the pathology of the eye as is possible in the present state of our knowledge."

How closely the author has kept this object in view, and how nearly he has attained it, will be obvious to readers who are familiar with ocular pathology. In comprehensiveness, in fulness of detail, and in wealth of illustration, this treatise exhibits a notable superiority over all previous monographs on the subject.

As curator of the museum at Moorfields Eye Hospital, the author has enjoyed opportunities for pathological study and investigation which may be justly termed exceptional. Much credit is due to him for the excellent use he has made of these opportunities, and also to the hospital authorities for their enlightened policy in maintaining a laboratory in which such good and permanently valuable work can be carried on.

The need of a book such as Dr. Parsons has given us has often been felt by those engaged in the study of ophthalmology, and especially by those who are unfamiliar with languages other than English. Much good work has been done, and great advances have been made in ocular pathology during the last ten or fifteen years, but the records of these accomplishments are widely scattered in scientific journals, hospital reports, and elsewhere, and are often unobtainable by the student. No attempt has hitherto been made, at all events successfully, to produce a work dealing comprehensively with the pathology of the eye. Hence the treatise now before us supplies a real want, and will prove (indeed, has already proved) of great assistance to those interested in this branch of medical science.

The author has wisely divided his work into four parts, and has thereby given us volumes of convenient

and easily portable size. We doubt if he has been as well advised in extending the publication of the volumes over so long a period as four years. As a result of this, his work has to suffer the disadvantage, common to all scientific books of protracted publication, that by the time the final volume is in print the earlier portion of the work requires revision to bring it up to date.

The plan adopted by the author has been to devote the first and second volumes to the "Pathological Histology" of the ocular tissues, and the third and fourth volumes to the "General Pathology" of the eye, this latter title having a very wide and inclusive character. This arrangement, although in many respects admirable, and possibly the most serviceable, has led to a certain amount of repetition, necessitated by the consideration of subjects under two headings. For example, if the reader wishes to look up the pathology of injuries, say, of the cornea, he will find the subject partly dealt with in the chapter on the cornea in vol. i., and partly in the chapter on injuries in vol. iv.

In vols. i. and ii. the pathological histology of the eye, eyelids, and orbit (cysts and tumours) is dealt with, each component part of the eyeball, e.g. the cornea, iris, lens, &c., being considered separately and very fully. As introductory to the description of the morbid histology of each structure, there is a brief but sufficient account of its normal histology. This materially enhances the usefulness of the book to those engaged in microscopic work, enabling them, without loss of time, to refresh their memory of the histology of healthy tissues, or to compare the characters of their specimens with those accepted as normal.

The bacteriology of the ocular tissues, a subject of great and increasing importance, is also included in these volumes. A brief and serviceable account is given of the established relations of micro-organisms to disease of the various ocular tissues. More than this could not reasonably be desired in a work not dealing specially with bacteriology.

The scope of vols. iii. and iv. is much wider than that of the preceding volumes, and embraces more than might naturally be expected from the title, "General Pathology of the Eye."

In addition to subjects legitimately included under this heading, vol. iii. contains a lengthy account of the normal circulation of the eye, the nutrition of the eye, and the normal intra-ocular pressure. We are unable to agree with the author's view that "it is essential to give an exhaustive account of the normal circulation and nutrition of the eye" in a work on pathology. These three chapters, excellent in themselves, are much too elaborate as an introduction to the consideration of morbid conditions, and might with advantage be greatly curtailed in future editions.

Vol. iv., in addition to chapters on injuries, orbital inflammations, sympathetic ophthalmitis, &c., contains a very instructive chapter dealing with the morbid changes in symptomatic diseases of the eye, as, for example, the ocular lesions associated